State of Hawaii
DEPARTMENT OF LAND AND NATURAL RESOURCES
Division of Aquatic Resources
Honolulu, Hawaii 96813

July 8, 2011

Board of Land
and Natural Resources
Honolulu, Hawaii

Request for Authorization and Approval to Issue a Papahānaumokuākea Marine National Monument Research Permit to Dr. Greta Aeby, University of Hawaii, Hawaii Institute of Marine Biology, for Access to State Waters to Conduct Coral and Fish Disease Research Activities

The Division of Aquatic Resources (DAR) hereby submits a request for your authorization and approval for issuance of a Papahānaumokuākea Marine National Monument research permit to Dr. Greta Aeby, assistant researcher, University of Hawaii, Hawaii Institute of Marine Biology, pursuant to § 187A-6, Hawaii Revised Statutes (HRS), chapter13-60.5, Hawaii Administrative Rules (HAR), and all other applicable laws and regulations.

The research permit, as described below, would allow entry and research activities to occur in Papahānaumokuākea Marine National Monument (Monument), including the NWHI State Marine Refuge and the waters (0-3 nautical miles) surrounding the following sites:

- Nihoa Island
- Necker Island
- French Frigate Shoals
- Gardner Pinnacles
- Maro Reef
- Laysan Island
- Lisianski Island, Neva Shoal
- Pearl and Hermes Atoll
- Kure Atoll

The activities covered under this permit would occur between July 15, 2011 and September 30, 2011.

The proposed activities are largely a renewal of work previously permitted in the Monument.

INTENDED ACTIVITIES:

The purpose of these activities is to examine coral and fish disease occurring within the Monument.

Coral disease

The objectives of the activities are to

- determine the incidence (change in disease levels through time) of coral disease at several sites within the Monument;
- determine whether growth anomalies affect the growth of table corals
- determine whether removal of growth anomalies (GAs) off of table corals enhances growth or reproduction of affected colonies

To conduct this research, the applicant would survey reefs for coral disease, mark and photograph individual colonies exhibiting signs of disease, repair permanent sites, and surgically remove growth anomalies off of corals to determine the efficacy of this method for managing this disease.

Disease surveys

Re-survey of established sites throughout the Monument would follow established protocol. Transect lines would be laid out along the permanent pins. Corals along the lines would be identified to species, counted, and assigned to a size class. In addition, divers would examine all corals for signs of bleaching or disease. For corals exhibiting disease, a general description of the condition would be recorded, the coral would be photographed and a specimen would be collected for histopathological examination. Colonies tagged in 2005 or 2006 would be relocated, remarked and photographed. Any new infected colonies along the transect would be photographed and tagged. Any lost pins would be replaced.

The Applicant requests to collect additional samples of diseased corals that have not already been characterized by histology. She anticipates a maximum of 50 samples per island (25 samples from diseased corals, 25 samples from nearby healthy corals of same species) to be collected if new diseases are encountered. Sample sizes would be 3-5 cm each.

Growth studies and tumor removal

Colonies of Acropora cytherea with growth anomalies and a nearest neighbor of similar size would be measured, photographed and tagged. T hey would be re-examined the following year (2012) to look for differences in growth between affected and control colonies.

Ten acropora colonies with growth anomalies and five healthy nearest neighbor colonies would be surveyed as described above. Growth anomalies would be removed from five of the colonies. GAs would be bagged at depth and processed onboard the ship for further study. In addition, small tissue samples (1 cm) from the colonies marked for the tumor removal experiement (10 diseased and 5 healthy) will be collected for molecular analysis. A further 50 samples each of tumors and healthy tissue from different colonies will be collected as possible to aid in genetic analysis.

Fish disease

The objectives of the activities are to

- determine distribution and prevalence of fish disease
- determine the affect of disease on the body condition of fish
- determine the distribution and prevalence of parasitic diseases in zooplankton

Fish surveys
Visual surveys of populations of surgeonfish and butterflyfish will be conducted at all islands visited. Census techniques will consist of linear timed swims (using SCUBA) of 45-60 min where all acanthurids and chaetodontids with and without skin lesions or tumors will be enumerated. The methods proposed are the same as those used to document prevalence of fish disease within the MHI.

Histology
Fish with noticeble lesions would be collected by spear, placed on ice and transported to the ship for examination. Fish will be weighed and measured, examined systematically externally and internally, and gross lesions documented. For histopathology, sections of various internal parts would be excised and fixed in 10% neutral buffered formalin. Histopathology allows one to characterize microscopic morphology of disease, provide systematic evaluation of cellular changes that occur in disease, and afford the opportunity to detect microorganisms and the host response to these organisms.

The applicant is requesting to collect a maximum of 20 fish per species per island for two species of surgeonfish (Ctenochatus strigosus and Acanthurus nigrofuscus) as well as for additional species of surgeonfish and butterflyfish (up to 6 species) if found to be diseased

Zooplankton surveys
Zooplankton would be collected, opportunistically, by plankton tows. Two tows would be conducted, each lasting 10 minutes, at the following locations: near reef and in open water. All samples would be preserved in 10% formalin and transported back to a lab in Honolulu. Samples would be sorted and screened for parasitic infections.

The activities proposed by the applicant directly support the Monument Management Plan's priority management needs 3.1 – Understanding and Interpreting the NWHI (through action plan 3.1.1 – Marine Conservation Science).

The activities described above may require the following regulated activities to occur in State waters:

- ☒ Removing, moving, taking, harvesting, possessing, injuring, disturbing, or damaging any living or nonliving monument resource
- ☒ Drilling into, dredging, or otherwise altering the submerged lands other than by anchoring a vessel; or constructing, placing, or abandoning any structure, material, or other matter on the submerged lands
- ☒ Touching coral, living or dead
- ☒ Possessing fishing gear except when stowed and not available for immediate use during passage without interruption through the Monument
- ☒ Swimming, snorkeling, or closed or open circuit SCUBA diving within any Special Preservation Area or Midway Atoll Special Management Area

REVIEW PROCESS:

The permit application was sent out for review and comment to the following scientific and cultural entities: Hawaii Division of Aquatic Resources, Hawaii Division of Forestry and Wildlife, Papahānaumokuākea Marine National Monument (NOAA/NOS), NOAA Pacific Islands Regional Office (NOAA-PIRO), United States Fish and Wildlife Service Hawaiian and Pacific Islands National Wildlife Refuge Complex Office, and the Office of Hawaiian Affairs (OHA). In addition, the permit application has been posted on the Monument Web site since March 10th, giving the public an opportunity to comment. The application was posted within 40 days of its receipt, in accordance with the Monument's Public Notification Policy.

Comments received from the scientific community are summarized as follows:

Scientific reviews support the acceptance of this application.

Concerns raised:

1. What will be done with specimens after the histopathological and parasitological analyses?

   The Applicant states that all parasites will be cataloged at the Hawaii Institute of Marine Science and all histological slides will be kept at the USGS Wildlife Health Center.

Comments received from the Native Hawaiian community are summarized as follows:

Cultural reviews support the acceptance of this application.

Concerns raised:

1. Would Ms. Aeby please express her thoughts about what impact (positive or negative) she thinks that her proposed work would have on the resources of Papahanaumokuakea that Native Hawaiians find to be sacred and significant?

The Applicant states that the reefs of PMNM, which the Applicant hopes to help protect, are the very foundation which produced the numerous atolls and islands of the Monument. The Applicant recognizes and respects that these reefs and islands are Native Hawaiians ancestral lands and thus have special cultural significance. It is the Applicant's intent to enter and work in PMNM with respect for the cultural and natural resources, working to minimize any negative impact and only suggest research that she feels will have a positive impact from the knowledge gained and then applied to maintaining PMNM for all future generations.

Comments received from the public are summarized as follows:

No comments were received from the public on this application.

Additional reviews and permit history:

Are there other relevant/necessary permits or environmental reviews that have or will be issued with regard to this project? (e.g. MMPA, ESA, EA) Yes ☒ No ☐
If so, please list or explain:

- The proposed activities are in compliance with the National Environmental Policy Act.
- The Department has made an exemption determination for this permit in accordance chapter 343, HRS, and Chapter 11-200, HAR. See Attachment ("DECLARATION OF EXEMPTION FROM THE PREPARATION OF AN ENVIRONMENTAL ASSESSMENT UNDER THE AUTHORITY OF CHAPTER 343, HRS AND CHAPTER 11-200 HAR, FOR PAPAHĀNAUMOKUĀKEA MARINE NATIONAL MONUMENT RESEARCH PERMIT TO DR. GRETA AEBY, HAWAII INSTITUTE OF MARINE BIOLOGY, FOR ACCESS TO STATE WATERS TO CONDUCT CORAL AND FISH DISEASE RESEARCH ACTIVITIES UNDER PERMIT PMNM-2011-020")

Has Applicant been granted a permit from the State in the past? Yes ☒ No ☐
If so, please summarize past permits:

- The applicant was granted permit DLNR/NWHI/06R008 to conduct similar work in 2009.
- In addition, joint Monument permit PMNM-2008-036 was issued to Dr. Fenny Cox for similar work in 2008, but the activities were never carried out.

Have there been any a) violations: Yes ☒ No ☐
b) Late/incomplete post-activity reports: Yes ☐ No ☒

- The 2006 state permit, referenced above, resulted in a violation against Greta Aeby. Her violation fine was paid in 2008.

Are there any other relevant concerns from previous permits? Yes ☐ No ☒

STAFF OPINION

DAR staff is of the opinion that Applicant has properly demonstrated valid justifications for her application and should be allowed to enter the NWHI State waters and to conduct the activities therein as specified in the application with certain special instructions and conditions, which are in addition to the Papahānaumokuākea Marine National Monument Research Permit General Conditions. All suggested special conditions have been vetted through the legal counsel of the Co-Trustee agencies (see Recommendation section).

MONUMENT MANAGEMENT BOARD OPINION

The MMB is unanimous in their belief that further understanding of coral disease is vital to the management of the Northwestern Hawaiian Islands. The MMB is of the opinion that the Applicant has met the technical requirements of Findings 1-9 of Presidential Proclamation 8031. Due to the Applicant's prior state violation, though now resolved, the MMB has not yet reached consensus on Finding 10 ("There are no other factors that would make the issuance of a permit for the activity inappropriate"). The MMB continues to explore unresolved federal policy and legal issues, related to the previous state violation by this applicant, that may preclude issuance of this permit. The MMB concurs with the special conditions by DAR staff.

RECOMMENDATION

Based on the attached proposed declaration of exemption prepared by the department after consultation with and advice of those having jurisdiction and expertise for the proposed permit actions:

1. That the Board declare that the actions which are anticipated to be undertaken under this permit will have little or no significant effect on the environment and is therefore exempt from the preparation of an environmental assessment.

2. Upon the finding and adoption of the department's analysis by the Board, that the Board delegate and authorize the Chairperson to sign the declaration of exemption for purposes of recordkeeping requirements of chapter 343, HRS, and chapter 11-200, HAR.

3. That the Board authorize and approve a Research Permit to Dr. Greta Aeby, Hawaii Institute of Marine Biology, with the following special conditions:

a. This permit is not to be used for nor does it authorize the sale of collected organisms. Under this permit, the authorized activities must be for noncommercial purposes not involving the use or sale of any organism, by-products, or materials collected within the Monument for obtaining patent or intellectual property rights.

b. The permittee may not convey, transfer, or distribute, in any fashion (including, but not limited to, selling, trading, giving, or loaning) any coral, live rock, or organism collected under this permit without the express written permission of the Co-Trustees.

c. To prevent introduction of disease or the unintended transport of live organisms, the permittee must comply with the disease and transport protocol attached to this permit.

d. Tenders and small vessels must be equipped with engines that meet EPA emissions requirements.

e. Refueling of tenders and all small vessels must be done at the support ships and outside the confines of lagoons or near-shore waters in the State Marine Refuge.

f. No fishing is allowed in State Waters except as authorized under State law for subsistence, traditional and customary practices by Native Hawaiians.

Respectfully submitted,

for Administrator

APPROVED FOR SUBMITTAL

William J. Aila, Jr.
Chairperson

Papahānaumokuākea Marine National Monument

RESEARCH Permit Application

NOTE: ***This Permit Application (and associated Instructions) are to propose activities to be conducted in the Papahānaumokuākea Marine National Monument. The Co-Trustees are required to determine that issuing the requested permit is compatible with the findings of Presidential Proclamation 8031. Within this Application, provide all information that you believe will assist the Co-Trustees in determining how your proposed activities are compatible with the conservation and management of the natural, historic, and cultural resources of the Papahānaumokuākea Marine National Monument (Monument).***

ADDITIONAL IMPORTANT INFORMATION:

- Any or all of the information within this application may be posted to the Monument website informing the public on projects proposed to occur in the Monument.

- In addition to the permit application, the Applicant must either download the Monument Compliance Information Sheet from the Monument website OR request a hard copy from the Monument Permit Coordinator (contact information below). The Monument Compliance Information Sheet must be submitted to the Monument Permit Coordinator after initial application consultation.

- Issuance of a Monument permit is dependent upon the completion and review of the application and Compliance Information Sheet.

INCOMPLETE APPLICATIONS WILL NOT BE CONSIDERED

Send Permit Applications to:
Papahānaumokuākea Marine National Monument Permit Coordinator
6600 Kalaniana'ole Hwy. # 300
Honolulu, HI 96825
nwhipermit@noaa.gov
PHONE: (808) 397-2660 FAX: (808) 397-2662

SUBMITTAL VIA ELECTRONIC MAIL IS PREFERRED BUT NOT REQUIRED. FOR ADDITIONAL SUBMITTAL INSTRUCTIONS, SEE THE LAST PAGE.

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Papahānaumokuākea Marine National Monument
Permit Application Cover Sheet

This Permit Application Cover Sheet is intended to provide summary information and status to the public on permit applications for activities proposed to be conducted in the Papahānaumokuākea Marine National Monument. While a permit application has been received, it has not been fully reviewed nor approved by the Monument Management Board to date. The Monument permit process also ensures that all environmental reviews are conducted prior to the issuance of a Monument permit.

Summary Information

Applicant Name: Greta Smith Aeby
Affiliation: HIMB

Permit Category: Research
Proposed Activity Dates: May 1 - Sept 30, 2010
Proposed Method of Entry (Vessel/Plane): NOAA research vessel Hiialakai
Proposed Locations: shallow water reefs throughout the Monument (Nihoa, Necker, FFS, Gardner, Pearl and Hermes, Maro, Laysan, Lisianski, Midway, Kure,)

Estimated number of individuals (including Applicant) to be covered under this permit: 5
Estimated number of days in the Monument: 21-28 days

Description of proposed activities: (complete these sentences):

a.) The proposed activity would…

Determine the prevalence and incidence (change in levels through time) of coral disease within the Monument and test a potential method for mitigating damage from Acropora growth anomalies. Determine whether intrinsic factors such as genetic relatedness or zooxanthellae clade may help explain the high prevalence of Acropora growth anomalies (~40% of the colonies) within "tumor city" at FFS as compared to disease levels elsewhere within the Monument and the Indo-Pacific (<1% of the coral colonies). Fish (surgeonfish and butterfly fish) with skin cancer would be surveyed to determine distribution and prevalence of the disease in fish populations. Determine the effect of skin cancer on the body condition of fish. Baseline studies on the parasites of zooplankton will be initiated.

b.) To accomplish this activity we would ….

Survey reefs for coral disease, mark and photograph individual colonies exhibiting signs of disease, repair permanent sites, surgically remove growth anomalies off of table corals to determine efficacy of this method for managing disease. GA-affected and healthy table corals would be sampled for follow-up molecular studies for relatedness and zooxanthellae clade by the Toonen lab. Surgeonfish and butterflyfish populations wll be surveyed for disease. Surgeonfish

and butterflyfish with skin cancer would be collected to examine the effect of the disease on the body condition of the fish. Plankton tows will be used to collect zooplankton at the different islands to be screened for parasite infections.

c.) This activity would help the Monument by …
giving them information as to the health status of their reefs, ability to predict amount of damage to reefs from coral disease through time, and a potential method to mitigate a disease of concern, Acropora growth anomalies. The prevalence of disease at "tumor city" is unusually high and could be due to intrinsic factors such as the genetic relatedness or zooxanthellae clade of the table corals at that site and/or extrinsic factors such as contaminants. Molecular studies on coral colonies with this disease will help answer this question. Studies of fish disease will give them information on how widespread cancer is in fish populations within the Monument and screening zooplankton for parasitic infections will aid understanding of ecosystem health and disease transmission.

Other information or background: Global climate change and human activities are placing coral reef ecosystems at risk. Coral reefs worldwide are now declining at an alarming rate. Mass bleaching events have increased dramatically since the 1980's and have usually been linked to El Nino or global warming-related increases in annual sea surface temperature (Brown 1997, Barber et al. 2001). The El Nino Southern Oscillation (ENSO) conditions during 1997 to 1998 resulted in worldwide bleaching from the Western Atlantic to the Great Barrier Reef. ENSO events have increased in frequency and duration in the past two decades (Barber et al. 2001, Walker 2001) and it has been predicted that the frequency and severity of coral bleaching will also continue to rise (Hoegh-Guldberg 1999).

Disease in coral reef ecosystems has received great attention, particularly in the western Atlantic where coral disease has been incriminated in the marked degradation of reef habitats. (Santavy and Peters 1997, Green and Bruckner 2000). Coral disease is reported to be responsible for the dramatic decline of Acroporids, one of the major frame-building corals in the Florida Keys, changing the structure and function of the coral reef ecosystem (Aronson & Precht 2001). Despite the major impact disease can have on reef systems, the etiology of most coral diseases remains unclear (Santavy and Peters 1997, Richardson 1998). The causative agents, mechanism of pathogenesis and link to environmental or anthropogenic stress are still largely unknown (Richardson 1998, Green & Bruckner 2000).

The reefs of the Northwestern Hawaiian Islands (NWHI) are considered to be relatively healthy but they are not immune to the conditions that have led to the decline of other reef systems. In September 2002, the first mass-bleaching event was recorded on the reefs of the NWHI with a second bleaching event occurring in 2004. In the three northwestern-most atolls of the Archipelago (Pearl & Hermes, Midway and Kure) over half of all sites had significant bleaching (Aeby et al. 2003, Kenyon et al., 2005). Ten coral disease states have now been described from the NWHI (Aeby 2006) and we have established permanent sites which allow us to determine both temporal and spatial changes in diseases through time and the ultimate affect of disease on the health of the ecosystem. We will measure changes in disease levels through time, rates of tissue loss from different diseases, patterns of disease transmission among colonies, rate of spread of disease and evaluate changes in coral cover and coral species composition. In

addition, two diseases of concern have been identified, Acropora white syndrome and Acropora growth anomalies which we are targeting for focused studies.

Acropora white syndrome (AWS) is a disease which causes acute tissue loss in acroporids and has been reported from across the Indo-Pacific. Acropora white syndrome appeared on one reef in the northwestern Hawaiian Islands (NWHI) in 2003 (Aeby 2006) and has since spread. Our prior studies in 2005 and 2006 found this disease to be highly virulent having killed over 19 large table acroporids with numerous other colonies suffering massive tissue loss from the disease. The disease occurs predominantly at French Frigate Shoals (FFS) within the NWHI, which is the center of abundance and diversity of acroporids in Hawaii. We plan to continue to follow the dynamics of this disease by re-surveying permanent sites to measure coral mortality and disease spread.

Disease can affect coral communities directly through mortality of colonies (partial or whole) resulting in reduced coral cover (such as we found for AWS) or indirectly through sub-lethal events such as reduced growth, resilience or reproduction. From our 2006 study we discovered that Acropora cytherea with growth anomalies suffer a significant reduction in reproductive output. We would now like to determine whether this disease also affects the growth of colonies and whether removal of growth anomalies could be an effective management tool. During our prior studies we documented the occurrence of "dead zones" within "tumor city" at one of our permanent sites. This suggest that this disease is slowing killing corals through time. By tagging individual affected colonies for growth studies we will also be able to determine the lethality of this disease through time. "Tumor city" at FFS has an unusually high prevalence of Acropora growth anomalies (40%) as compared to other areas (<1%). We hypothesize this could be due to intrinsic factors (genetic susceptibility, zooxanthellae clade, etc) or extrinsic factors such as contaminants in the environments. As a first cut in understanding why disease levels are so high on that reef, we will examine the genetic relatedness and zooxanthellae clades of affected vs. unaffected colonies found on that reef. This work will be conducted in collaboration with the Toonen lab.

Diseases in marine ecosystems are not only limited to corals. Fibropapillomatosis of green turtles has been known in Hawaii since the 1950s (Balaz 1991). More recently, high levels of infections with bacteria and protozoa have been seen in taape (Lutjanus kasmira) (Work et al. 2003). Taape were introduced into Hawaii in the 1950s (Randall 1987) and have spread all the way to Midway Atoll. Taape are closely associated with certain native fish such as goatfish (Mulloidichthys sp.) (Friedlander et al. 2002) and goatfish from the main Hawaiian Islands have been found to be infected with some of the same diseases as taape (Work et al. unpub. data). Given that taape were introduced into Hawaii, there is the concern that the recently documented diseases may have been introduced with them from the Marquesas. Taape are infected with a parasitic gut nematode that is thought to have been brought into the Hawaiian ecosystem with the introduction of the fish. This nematode infection has also been found in co-occurring native goatfish species. Taape were orginally introduced into Oahu and have recruited out to other islands and up into the NWHI. The question now arises as to whether disease transmission has occurred from the main HI out to the NWHI.

From our 2006 study we found that taape from FFS had the nematode infection yet this disease was not found in fish from Midway. It appears that there is a lag in the time required for taape to establish in the NWHI as compared to the establishment of fish disease. The spread of both taape and its diseases up into the NWHI may be reflective of real time ecological linkages

between islands within the Hawaiian archipelago. We have a rough timeline of the spread of taape from Oahu out to Midway and could correlate that with the eventual emergence of this disease at Midway. From studies in 2006, we also found that species of native goatfishes from FFS also have the nematode infection. We would like to also sample goatfishes from the other islands we are visiting to determine whether the pattern of disease is similar to that found in taape. We are piggybacking this objective onto the goals of othere labs examining the genetics and life history paramaters of these same fish species.

Based upon studies of similar nematodes, we hypothesized that the first intermediate host of the potentially introduced parasitic red nematode is a planktonic copepod which could be the mechanism of disease dispersal throughout the Hawaiian Islands. Preliminary work at our lab at HIMB has identified suitable copepod hosts species to be Lobidocera madurae and Undinula vulgaris. During this study we also found that the zooplankton in Kaneohe Bay contained a variety of different larval parasites. Parsites transmitted through the foodchain, such as these within the copepods, are useful as potential indicators of ecosystem health. Parasites can only remain in host populations if all hosts within the life cycle are present and in sufficient numbers to maintain the disease. Hence, healthy ecosystems may have higher levels of certain types of parasites as compared to more degraded regions where host abundance is reduced. We would now like to compare the parasite levels of the zooplankton within the NWHI with our findings within the MHI and explore whether there is evidence that copepods infected with the larval stage of the red nematode may be the mechanism of disease spread within the Hawaiian Archipelago. Recent work by the Bowen lab has characterized the red nematode at the molecular level and so similar techniques will be used to identify this parasite within copepods.

From our 2005 and 2006 studies we found that the surgeonfish, Ctenochaetus strigosus, (kole) with a pigment discoloration had pathology consistent with cancerous lesions. Further survey work within the MHI found diseased kole on Oahu, Maui, Kauai and Molokai. We also observed several other species of surgeonfish with similar patterns of discoloration and several species of butterflyfish with tumors. Using the same survey method used in the MHI we would now like to compare distribution and prevalence of diseased fish in the NWHI.

It is important for management agencies to have a through understanding of the vulnerability of these reefs to disease and the first steps in managing disease are developing an understanding of the causes of disease, modes of transmission and assessing its geographic extent. Mangement of disease in wildlife populations usually involves either reducing or removing the source of infection or reducing the spread of the disease. However, before appropriate management plans can be made the epizootiology of diseases must be understood. Our studies, past, present and proposed, are suppling critical information into disease dynamics in both coral and reef fish within the NWHI.

Section A - Applicant Information

1. Applicant

Name (last, first, middle initial): Aeby, Greta S.

Title: assistant researcher

1a. Intended field Principal Investigator (See instructions for more information):
Dr. Greta Aeby

2. Mailing address (street/P.O. box, city, state, country, zip): [redacted]

Phone: [redacted]

Fax: [redacted]

Email: [redacted]

For students, major professor's name, telephone and email address:

3. Affiliation (institution/agency/organization directly related to the proposed project):
Hawaii Institute of Marine Biology

4. Additional persons to be covered by permit. List all personnel roles and names (if known at time of application) here (e.g. John Doe, Research Diver; Jane Doe, Field Technician):

Dr. Fenny Cox: co-investigator

Dr. Frank Stanton: co-investigator

Amanda Shore: graduate student

Maya Walton: graduate student

Section B: Project Information

5a. Project location(s):

		Ocean Based	
☒ Nihoa Island	☐ Land-based	☒ Shallow water	☐ Deep water
☒ Necker Island (Mokumanamana)	☐ Land-based	☒ Shallow water	☐ Deep water
☒ French Frigate Shoals	☐ Land-based	☒ Shallow water	☐ Deep water
☒ Gardner Pinnacles	☐ Land-based	☒ Shallow water	☐ Deep water
☒ Maro Reef			
☒ Laysan Island	☐ Land-based	☒ Shallow water	☐ Deep water
☒ Lisianski Island, Neva Shoal	☐ Land-based	☒ Shallow water	☐ Deep water
☒ Pearl and Hermes Atoll	☐ Land-based	☒ Shallow water	☐ Deep water
☒ Midway Atoll	☐ Land-based	☒ Shallow water	☐ Deep water
☒ Kure Atoll	☐ Land-based	☒ Shallow water	☐ Deep water
☐ Other			

NOTE: There is a fee schedule for people visiting Midway Atoll National Wildlife Refuge via vessel and aircraft.

Location Description:

shallow reefs throughout the Monument

5b. Check all applicable regulated activities proposed to be conducted in the Monument:

☒ Removing, moving, taking, harvesting, possessing, injuring, disturbing, or damaging any living or nonliving Monument resource

☒ Drilling into, dredging, or otherwise altering the submerged lands other than by anchoring a vessel; or constructing, placing, or abandoning any structure, material, or other matter on the submerged lands

☒ Anchoring a vessel

☐ Deserting a vessel aground, at anchor, or adrift

☐ Discharging or depositing any material or matter into the Monument

☒ Touching coral, living or dead

☒ Possessing fishing gear except when stowed and not available for immediate use during passage without interruption through the Monument

☐ Attracting any living Monument resource

☐ Sustenance fishing (Federal waters only, outside of Special Preservation Areas, Ecological Reserves and Special Management Areas)

☐ Subsistence fishing (State waters only)

☒ Swimming, snorkeling, or closed or open circuit SCUBA diving within any Special Preservation Area or Midway Atoll Special Management Area

6 Purpose/Need/Scope ***State purpose of proposed activities:***

1. To re-survey permanent sites for assessment of disease dynamics
2. To conduct new disease surveys at any sites of interest to management
3. To determine whether growth anomalies affect the growth and/or survival of table corals
4. To determine whether removal of growth anomalies off of table corals will enhance the growth and/or survival of affected colonies
5. To determine distribution and prevalence of fish disease
6. To determine the affect of skin cancer on the body condition of fish
7. To determine distribution and prevalence of parasitic diseases in zooplankton
8. To determine the genetic relatedness and zooxanthellae clades of GA-affected vs. healthy coral colonies within "tumor city" at FFS.

7. Answer the Findings below by providing information that you believe will assist the Co-Trustees in determining how your proposed activities are compatible with the conservation and management of the natural, historic, and cultural resources of the Monument:

The Findings are as follows:

a. How can the activity be conducted with adequate safeguards for the cultural, natural and historic resources and ecological integrity of the Monument?

Activities willl be conducted in a manner to minimally impact coral reef resources and standard protocols for disease studies developed for the Monument will be used. All gear will be sterilized each day and any collected organisms will be placed in plastic bags at depth before transer to the small boat. All laboratory work willl be conducted using established biosecure protocols including sterilizing all tools and work surfaces. All biological samples will be fixed in solution for transport to our laboratories in Honolulu.

b. How will the activity be conducted in a manner compatible with the management direction of this proclamation, considering the extent to which the conduct of the activity may diminish or enhance Monument cultural, natural and historic resources, qualities, and ecological integrity, any indirect, secondary, or cumulative effects of the activity, and the duration of such effects?

The collapse of coral reefs from disease in other regions points to the critical need to understand disease processes. Our research program is dedicated to studying disease

in the Monument so that managers have the information they need to protect these vulnerable resources. All researsh proposed in this permit application is directly applicable to the management of diseases of coral and fish within the region. All surveys are conduced in a manner causing little to no impact on the environment as they use visual and phtographic techniques. We will be collecting the minimal number of fish or coral samples required to complete our laboratory analyses.

c. Is there a practicable alternative to conducting the activity within the Monument? If not, explain why your activities must be conducted in the Monument.

There is no alternative to conducting the activity in the Monument. Although, comparative studies of disease in other regions are useful, they cannot replace understanding damage from the specific diseases affecting fish and coral populations in the Monument.

d. How does the end value of the activity outweigh its adverse impacts on Monument cultural, natural and historic resources, qualities, and ecological integrity?

If diseases are not managed in the Monument, the coral reefs will suffer the same fate as coral reefs in the Florida Keys and other regions of the Caribbean. In the Keys, their acroproids, which used to be their numerically dominant coral, have been reduced by 90% and are now on the endangered species list (Patterson et al. 2002). Acroporids in the Monument are already in decline due to two different diseases, Acropora white syndrome and Acorpora growth anomalies. Current models of global climate change predict a significant increase in sea surface temperature (Kleypas et al. 1999). Elevated temperatures have been shown to accelerate the growth rate and pathogenecity of pathogens and so it is predicted coral disease will become more common and widespread (Porter et al. 2001). On the GBR, increases in White Syndrome are associated with temperature anomalies. Acropora white syndrome is also currently killing corals in the Monument so information of the epizootiology of this disease is critically important for the development of both immediate and long-term mangement strategies. Reductions in fish populations from overfishing has contributed to the decline of reefs as algae are allowed to outcompete corals. The Monument is closed to fishing but its fish populations are known to suffer from diseases. Kole (Acanthurus

strigosus), an important herbivore, was found to have skin cancer. However, nothing is known about the distribution or prevalence of this disease in fish populations. Our studies on coral and fish diseases provide critical information necessary for management to address the already established disease outbreaks degrading the coral reef ecosystem of the Monument.

e. Explain how the duration of the activity is no longer than necessary to achieve its stated purpose.

We are requesting the absolute minimum amount of time require to condut our studies. We anticipate staying a maximun of 5 days at any one island within the Monument.

f. Provide information demonstrating that you are qualified to conduct and complete the activity and mitigate any potential impacts resulting from its conduct.

I have been conducting coral disease surveys and studies in the Monument since 2002. I am familiar with the reefs and methodology required to safely conduct all proposesd studies. I was involved in the development of protocols for investigations of coral disease developed for the Monument. I am also a co-author on the book "A coral disease handbook: guidelines for assessment, monitoring and management." and was the lead in developing Hawaii Division of Aquatic Resources "Rapid Response Contingency Plan for unusual events of coral bleaching, disease and COTS outbreaks". Both of these publications make recommendations for proper procedures involving investigating marine diseases including field techniques, the need for follow-up laboratory investigations and safe handling of samples.

g. Provide information demonstrating that you have adequate financial resources available to conduct and complete the activity and mitigate any potential impacts resulting from its conduct.

I am employed by the University of Hawaii and thus would be covered under University policies.

h. Explain how your methods and procedures are appropriate to achieve the proposed activity's goals in relation to their impacts to Monument cultural, natural and historic resources, qualities, and ecological integrity.

The Monuments goal is to preserve the integrity of the resources. Disease is already established in the Monument and is starting to degrade the coral populations. Fish disease has been documented in herbivorous fish in the Monument but there is no information on the extent of the

fish populations affected. If the Monument is to prevent irreparable damage from disease it must first have information on the extent and harm from diseases. Our research addresses these needs for the Monument and does so in the most minimally invasive manner as possible. Our methods are predominanatly visual surveys which do no harm. Marking of individual colonies is also non-invasive. Small samples will be taken of acroporids within "tumor city" for molecular analysis by the Toonen lab and of any new diseases encountered not yet characterized by histology. Surgical removal of growth anomalies will be undertaken to test the efficacy of this method for disease control. Collection of diseased fish and zooplankton are required for follow-up laboratory analyses.

i. Has your vessel has been outfitted with a mobile transceiver unit approved by OLE and complies with the requirements of Presidential Proclamation 8031?
yes

j. Demonstrate that there are no other factors that would make the issuance of a permit for the activity inappropriate.
I am an established disease scientist who has conducted similar research throughout the Indo-Pacific and in the Florida Keys with no problems. I am familiar with all required protocols in disease assessment and have help author numerous publications outlining proper response and procedure for investigating disease outbreaks.

8. Procedures/Methods:

Disease surveys: As possible, re-survey of established sites or new sites of interest (up to 6) throughout the Monument will be done following established protocols. Two 25 m lines will be laid out along the permanent pins. A diver will then swim over the lines during which all corals within one half meter of either side of the transect lines will be identified to specie, counted, and assigned to a size class (0-5cm; 6-10cm; 11-20cm; 21-40cm; 41-80cm; 81-150cm; >150cm.). In the same manner, a second diver will swim over the lines and examine all corals for signs of bleaching or disease. Bleached colonies will be assigned a bleaching category: 0-no bleaching; 1- 10-30%; 2-30-50%; 3-50-100%; 4- 100%; 5-mortality. For corals exhibiting disease, a general description of the condition will be recorded, the coral will be photographed and a specimen will be collected for histopathological examination. 50 samples/island for other coral diseases are requested and are to be used for histology to examine disease processes at the

cellular level. These samples will only be required if we come across diseased colonies within our transects. I am asking to be able to sample 25 diseased colonies (1 healthy and 1 diseased sample/colony) per island, which I estimate, based on disease prevalence from past surveys, as being sufficient to cover all the surveys at each of the islands. Individual colonies tagged in 2005 or 2006 will be relocated, remarked and photographed. At permanent sites, any new infected colonies along the transect will be photographed and tagged. Coral colonies are tagged by placing a cable tie through a natural hole in the colony thereby producing no harm to the coral. Any lost pins will be replaced and loose pins re-glued.

Acropora growth studies

Colonies of A. cytherea with growth anomalies and a nearest neighbor of similar size will be measured (length and width of each tier), photographed (with a ruler) and tagged. They will be re-examined the following year (2012) to look for differences in growth between affected and control colonies and changes in disease state. We will be tagging colonies located at our established permanent sites at FFS.

Acropora tumor removal

Ten acropora colonies with growth anomalies and five healthy nearest neighbor colonies will be surveyed as described above. Growth anomalies will be removed from five of the colonies. GAs will be bagged at depth and processed onboard the ship for further study. This removal treatment has already been used, to a limited extent, by scientists (G. Williams) at Palmyra Atoll. Although only a few colonies were treated, it was found that growth anomaly removal was effective in stopping the disease and there was no evidence of disease spread or that treatment adversely affect the treated colony. Although, we do not know whether this disease is infective or not, if it is, removal of the GAs would also remove a potential source of infection from the reefs. All colonies will be re-surveyed and sampled the following year to determine effect of the treatment on the growth and survival of colonies. Surveys will also reveal whether

the disease re-occurs after treatment and if so, to what extent. On the ship, GA samples will be fixed in zinc formalin for histology, gluteraldehyde for electron microscopy or bleached for skeletal analysis. Healthy coral samples will be fixed in zinc formalin for histology.

Genetic relatedness and zooxanthellae clade of affected and unaffected Acropora within "tumor city"

Small tissue samples (1.0 cm) from the colonies marked for the tumor removal experiment (10 diseased and 5 healthy) will be collected for molecular analysis by the Toonen lab. In addition up to 50 samples each of tumors and healthy tissue from different colonies will be collected as possible. All samples will be fixed in salt (DMSO) buffer for transfer to our labs at HIMB. The 50 requested samples for Acropora cytherea with and without tumors will be used for both genetic and zooxanthellae clade analyses.

Fish disease studies

Surveys

Visual surveys of populations of surgeonfish and butterfly fish will be conducted at all islands visited as possible. Census techniques will consist of linear timed swims (using SCUBA) of 45-60 min where all acanthurids and chaetodontids with and without skin lesions or tumors will be enumerated. Census tracks will be recorded using a float with GPS carried by one of the divers as well as recorded by the boat driver following our float. Area surveyed will be estimated from the GPS track, and the fish census data will be used to calculate fish density (fish/unit area) and prevalence of fish with skin lesions. These same methods have been used to document prevalence of fish disease within the MHI. Fish survey sites will be based upon fish monitoring data collected by the Monument and CRED. We will target sites with the highest recorded density of our fish species of interest.

Histology

Fish with noticeable lesions will be collected by spear, placed on ice and transported to the ship for examination. Fish will be weighed and measured (standard and fork length), examined systematically externally and internally, and gross lesions documented. For histopathology, sections of skeletal muscle, skin, spleen, liver, cranial and caudal kidneys, swim bladder, brain, heart, gill, and gonad, small intestines, and stomach will be excised and fixed in 10% neutral buffered formalin. Tissues will sectioned, dehydrated in alcohol series, embedded in paraffin, sectioned at 5 μm, placed on microscope slides, stained with hematoxylin and eosin, and examined using a light microscope. Special stains will be used as appropriate to identify fungi,

bacteria, or protozoa. Histopathology will allow us to characterize microscopic morphology of disease, will provide systematic evaluation of cellular changes that occur in disease, and will afford the opportunity to detect microorganisms and the host response to these organisms. We will be processing the fish samples upon our return from the small boats, however, fish will take a little longer to process as we will be taking measurements (length, weight) before the necropsy and so that will likely continue into the evening depending on how many samples we have to process.

Zooplankton surveys

Zooplankton will be collected, opportunistically, at the end of each workday by doing plankton tows as we return to the ship. Our plan is to conduct one plankton tow (10 min) at our dive site (near the reef) and another one in route to the ship (open water). However, we will have to adjust this as to how much time we have left in the day once we surface, etc. All samples will be preserved in 10% formalin or ethanol and transported back to our lab at HIMB. Samples will be sorted and screened for parasitic infections. Larval nematodes encountered within copepods will be examined by the Bowen lab using molecular techniques to determine if they are the invasive red nematode (S. istiblenni).

Table summarizing samples to be collected attached.

NOTE: If land or marine archeological activities are involved, contact the Monument Permit Coordinator at the address on the general application form before proceeding, as a customized application will be needed. For more information, contact the Monument office on the first page of this application.

9a. Collection of specimens - collecting activities (would apply to any activity): organisms or objects (List of species, if applicable, attach additional sheets if necessary):

Common name:
table coral

Scientific name:
Acropora cytherea

& size of specimens:
see attached table

Collection location:

FFS

☐ Whole Organism ☒ Partial Organism

9b. What will be done with the specimens after the project has ended?
Samples will be used up in the various analyses

9c. Will the organisms be kept alive after collection? ☒ Yes ☐ No
Samples will be kept alive until they can be fixed in solution on the ship. We will be processing the coral samples upon our return from the small boats so we should be done before leaving a location but that depends on how many samples we have and sometimes the ship leaves early, etc. so wanted to make sure we had some flexibility in processing time.

• General site/location for collections:
FFS

• Is it an open or closed system? ☐ Open ☒ Closed

• Is there an outfall? ☐ Yes ☒ No

• Will these organisms be housed with other organisms? If so, what are the other organisms?
no

• Will organisms be released?
no

10. If applicable, how will the collected samples or specimens be transported out of the Monument?
Transport of preserved samples out of the Monument would occur during transit between islands and back to the MHI

11. Describe collaborative activities to share samples, reduce duplicative sampling, or duplicative research:
Acroporid samples will be shared with the Toonen lab for molecular analyses

12a. List all specialized gear and materials to be used in this activity:

dive gear

coral collection gear (bone cutters, hammer, chisel, ziplock and whirlpak bags, bag to carry gear)

coral processing gear (plastic jars, z-fix, gluteraldehyde, clorox)

stereo microscope

cameras and underwater housing

sludge hammer, steel pins and underwater glue

field equipment (tape measures, floats, clipboards, underwater paper, cow ear tags, cable ties)

hand held GPS

computer

5 gal buckets with lids

Miscllaneous office supplies (books, tablets, pencils, pens, markers, scissors, stapler, 3-hole punch, etc.)

Personal gear (clothing, personal hygeine items, diet coke, snacks, sunglasses, etc)

Common name: reef fish

Scientific name: Targeted fish species include Ctenochaetus strigosus, Acanthurus nigrofuscus, Acanthurus sp., Chaetodon sp. In the MHI, the butterflyfish species that have been observed with tumors are Chaetodon multicinctus, C. miliaris, C. ornatissimus, C. kleinii, C. quadrimaculatus and C. ornatissimus hence we anticipate up to 6 species for collections

& size of specimens: see attached table

Collection location: shallow water reefs throughout the Monument (Nihoa, Necker, FFS, Gardner, Pearl and Hermes, Maro, Laysan, Lisianski, Midway, Kure,)

x Whole Organism Partial Organism

1b. What will be done with the specimens after the project has ended? The fixed samples will be transported to Oahu for parasitological and histopathological analysis.

1c. Will the organisms be kept alive after collection? Yes x No

• Specific site/location:
• Is it an open or closed system? 0 Open X Closed

• Is there an outfall? 0 Yes XNo

• Will these organisms be housed with other organisms? If so, what are the other organisms? no

• Will organisms be released? no

2. If applicable, how will the collected samples or specimens be transported out of the Monument? Samples will be transported on ice on small boats to the Hi'ialakai which may or may not be within Monument waters. Fixed samples will be transported back to Honolulu via the Hi'ialakai.

3. Describe collaborative activities to share samples, reduce duplicative sampling, or duplicative research: Fish samples will be collected by and shared with Brian Bowen's group and so they will also be used for both molecular and life history studies. We will only collect fish if we see diseased ones. The Bowen lab collects a set number of a specific species regardless. Hence, our request for a separate permit.

LIst all specialized gear to be used in this activity

dive gear
stereo microscope
cameras and underwater housing
field equipment (tape measures, floats, clipboards, underwater paper, cow ear tags, cable ties)
hand held GPS
computer
5 gal buckets with lids
Miscllaneous office supplies (books, tablets, pencils, pens, markers, scissors, stapler, 3-hole punch, etc.)
Personal gear (clothing, personal hygeine items, diet coke, snacks, sunglasses, etc)

Common name: reef coral

Scientific name: Porites sp., Montipora sp., Pocillopora sp., Pavona sp., Acropora sp. Species will vary depending upon disease occurrence.

& size of specimens: see attached table

Collection location: shallow water reefs throughout the Monument (Nihoa, Necker, FFS, Gardner, Pearl and Hermes, Maro, Laysan, Lisianski, Midway, Kure,)

Whole Organism XPartial Organism

1b. What will be done with the specimens after the project has ended? Fixed samples will be transported to Oahu for histopathological analyses.

1c. Will the organisms be kept alive after collection? XYes No

Corals will be transported live in buckets of sea water to the Hi'ialakai where they will be placed in Z-fix.

• Specific site/location:
• Is it an open or closed system? 0 Open XClosed

• Is there an outfall? 0 Yes XNo

• Will these organisms be housed with other organisms? If so, what are the other organisms? No

• Will organisms be released? No

2. If applicable, how will the collected samples or specimens be transported out of the Monument? Samples will be transported in buckets on small boats to the Hi'ialakai which may or may not be within Monument waters. Fixed samples will be transported back to Honolulu via the Hi'ialakai.

3. Describe collaborative activities to share samples, reduce duplicative sampling, or duplicative research: none

LIst all specialized gear to be used in this activity

dive gear
coral collection gear (bone cutters, hammer, chisel, ziplock and whirlpak bags, bag to carry gear)
coral processing gear (plastic jars, z-fix, gluteraldehyde, clorox)
stereo microscope
cameras and underwater housing

sludge hammer, steel pins and underwater glue
field equipment (tape measures, floats, clipboards, underwater paper, cow ear tags, cable ties)
hand held GPS
computer
5 gal buckets with lids
Miscllaneous office supplies (books, tablets, pencils, pens, markers, scissors, stapler, 3-hole punch, etc.)
Personal gear (clothing, personal hygeine items, diet coke, snacks, sunglasses, etc)

Common name: zooplankton

Scientific name: various species of mixed zooplankton

& size of specimens: see attached table

Collection location:shallow water reefs throughout the Monument (Nihoa, Necker, FFS, Gardner, Pearl and Hermes, Maro, Laysan, Lisianski, Midway, Kure,)

x Whole Organism Partial Organism

1b. What will be done with the specimens after the project has ended? The fixed samples will be transported to Oahu for parasitological analysis.

1c. Will the organisms be kept alive after collection? X Yes No
Zooplankton will be kept live after collection until transport to the Hiialakai where they will be screened and fixed in solution (formalin, DMSO, or ethanol)

• Specific site/location:

• Is it an open or closed system? 0 Open X Closed

• Is there an outfall? 0 Yes XNo

• Will these organisms be housed with other organisms? If so, what are the other organisms? no

• Will organisms be released? no

2. If applicable, how will the collected samples or specimens be transported out of the Monument? Samples will be transported in buckets on small boats to the Hi'ialakai which may or may not be within Monument waters. Fixed samples will be transported back to Honolulu via the Hi'ialakai.

3. Describe collaborative activities to share samples, reduce duplicative sampling, or duplicative research: Samples will be shared with the Bowen lab for molecular analyses

LIst all specialized gear to be used in this activity

dive gear
stereo microscope
cameras and underwater housing
field equipment (tape measures, floats, clipboards, underwater paper, cow ear tags, cable ties)
hand held GPS
computer
5 gal buckets with lids
plankton net

Miscllaneous office supplies (books, tablets, pencils, pens, markers, scissors, stapler, 3-hole punch, etc.)
Personal gear (clothing, personal hygeine items, diet coke, snacks, sunglasses, etc)

12b. List all Hazardous Materials you propose to take to and use within the Monument:
Clorox- 5 gallons-used for sterilization of equipment and growth anomaly processing for skeletal analyses.

Z-fix-1gallon-used for preserving coral samples for histology

Ethanol-1 gallon-used for preserving samples for molecular analyses

Gluteraldehyde-1 gallon-used for preserving coral samples for electron microscopy

Formaldehyde-1 gallon- used for preserving fish samples for histology

DMSO-1 gallon used for preserving samples for molecular analyses
All chemicals will be contained in bottles within secondary containment and will be transported out of the Monument and sent back to our lab at HIMB

13. Describe any fixed installations and instrumentation proposed to be set in the Monument:
Repair or replacement of steel pins at permanent monitoring sites.

14. Provide a time line for sample analysis, data analysis, write-up and publication of information:
Fall 2011-Spring 2012: histology, molecular analyses and parasitology processing.

Summer - Fall 2012: data analysis and report writing

15. List all Applicants' publications directly related to the proposed project:
Aeby, GS, Williams, GJ, Franklin, E, Haapkyla, J, Harvell, CD, Neale, S, Page, C, Raymundo L, Vargas-Angel, B, Willis, B, Work, T and S. Davy. In press. Growth Anomalies on the Coral Genera Acropora and Porites are Strongly Associated with Host Density and Human Population Size. PLoS one.

Aeby, GS, Bourne, DG, Wilson, B and TM Work. In press. Coral diversity and the severity of disease outbreaks: a cross-regional comparison of Acropora white syndrome in a species-rich region (American Samoa) with a species-poor region (Northwestern Hawaiian Islands). J Mar Bio

Williams, G., Work, T., Aeby, G. and S. Davy. 2010. Gross and microscopic morphology of lesions in Cnidaria from Palmyra Atoll, remote Central Pacific. J Invert Path 106(2): 165-173.

Work, TM and GS Aeby. 2010. Wound repair in Montipora capitata. J Invert Path 105:116-119.

Aeby, GS, Ross, M, Williams GJ, Lewis TD and TM Work. 2010. Disease dynamics of Montipora white syndrome within Kaneohe Bay, Oahu, Hawaii: distribution, seasonality, virulence, and transmission. Dis Aquat Org 91:1-8.

Work, TM, Vignon, M and GS Aeby. 2010. Microparasite ecology and health status of blue-lined snappers (Lutjanus kasmira) from the Pacific islands. Aquatic Biology 9:185-192.

Williams, G., Aeby, G., Cowie, R. and S. Davy. 2010. Predictive modeling of coral disease distribution within a reef system. PLoS one 5(2):e9264.

Kenyon, K, Wilkinson, C., and G. Aeby. 2010. Community structure of hermatypic corals at Midway Atoll in the Northwestern Hawaiian Islands: A legacy of human disturbance. Atoll Research Bulletin 581.

Aeby, G, Work, T, Fenner, D. and E. DiDonato. 2009. Coral and crustose coralline algae disease on the reefs of American Samoa. Proc Int. 11th Int. Coral Reef 197-201

Work, T., Aeby, G., Stanton, F., and D. Fenner. 2008. Overgrowth of fungi (endolithic hypermycosis) associated with multifocal to diffuse distinct amorphous dark discoloration of corals in the Indo-Pacific. Coral Reefs 27:663.

Work, T., Aeby, G. and S. Coles. 2008. Distribution and morphology of growth anomalies in Acropora from across the Indo-Pacific. Dis. Aquat. Org. 78(3):255-264.

Williams, G., Davy, S. and G. Aeby. 2008. Coral disease at Palmyra Atoll, a remote reef system in the Central Pacific. Coral Reefs 27:207.

Kenyon, J., Dunlap, M., Wilkinson, C. Page, K., Vroom, P and G. Aeby. 2007. Community structure of hermatypic corals at Pearl and Hermes Atoll, Northwestern Hawaiian Islands: Unique conservation challenges within the Hawaiian archipelago. Atoll Research Bulletin 549.

Kenyon, J., Wilkinson, C., Dunlap, M., Aeby, G. and C. Kryss. 2007. Community structure of hermatypic corals at Laysan and Lisianski/Neva Shoal, Northwestern Hawaiian Islands: A new layer of scientific exploration. Atoll Research Bulletin 550:

Aeby, G.S. 2007. First record of coralline lethal orange disease (CLOD) in the Northwestern Hawaiian Islands. Coral Reefs 26(2):385.

Aeby, G.S. 2007. Spatial and temporal patterns of infection of Porites trematodiasis on the reefs of Kaneohe Bay, Oahu, Hawaii. Bull. Mar. Sci. 80(1):209-218.

Aeby, G.S. 2006. Baseline levels of coral disease in the Northwestern Hawaiian Islands. Atoll Research Bulletin 543:471-488.

Domart-Coulon, J., N.Traylor-Knowles, E. Peters, D. Elbert, C. Downs, K. Price, J. Stubbs, S. McLaughlin, E. Cox, G. Aeby, P. Brown and G. Ostrander. 2006. Comprehensive characterization of skeletal tissue growth anomalies of the finger coral Porites compressa. Coral Reefs 25:531-543. Symp. 197-201.

Kenyon, J., Wilkinson, C. and G. Aeby. 2008. Community structure of hermatypic corals at Maro reef in the Northwestern Hawaiian Islands: A unique open atoll. Atoll Research Bulletin 558.

Work, T. and G. Aeby. 2006. Systematically describing gross lesions in corals. Dis Aquatic Org 70:155-160.

Kenyon, J. G. Aeby, R. Brainard, J. Chojnacki, M. Dunlap, C. Wilkinson. 2006. Mass coral bleaching on high-latitude reefs in the Hawaiian Archipelago. Proc. 10th Int. Coral Reef Symp. 631-643.

Kenyon, J., Vroom, P., Page, K., Dunlap, M., Wilkinson, C. and G. Aeby. 2006. Community Structure of Hermatypic Corals at French Frigate Shoals, Northwestern Hawaiian Islands: Capacity for Resistance and Resilience to Selective Stressors. Pac Sci 60(2):153-175.

Maragos, J., D. Potts, G. Aeby, D. Gulko, J. Kenyon, D. Siciliano, and D. VanRavensway. 2004. The 2000-2002 Rapid Ecological Assessment of Corals in the Northwestern Hawaiian Islands, Part I: Species and Distribution. Pacific Science 58(2):211-230 .

Aeby, G. 2003. Corals in the genus Porites are susceptible to infection by a larval trematode. Coral Reefs 22:216.

Aeby, G.S., Kenyon, J., Maragos, J. and Potts, D. 2003. First record of mass coral bleaching in the Northwestern Hawaiian Islands. Coral Reefs 22:256.

With knowledge of the penalties for false or incomplete statements, as provided by 18 U.S.C. 1001, and for perjury, as provided by 18 U.S.C. 1621, I hereby certify to the best of my abilities under penalty of perjury of that the information I have provided on this application form is true and correct. I agree that the Co-Trustees may post this application in its entirety on the Internet. I understand that the Co-Trustees will consider deleting all information that I have identified as "confidential" prior to posting the application.

Signature Date

SEND ONE SIGNED APPLICATION VIA MAIL TO THE MONUMENT OFFICE BELOW:

Papahānaumokuākea Marine National Monument Permit Coordinator
6600 Kalaniana'ole Hwy. # 300
Honolulu, HI 96825
FAX: (808) 397-2662

DID YOU INCLUDE THESE?
☒ Applicant CV/Resume/Biography
☒ Intended field Principal Investigator CV/Resume/Biography
☒ Electronic and Hard Copy of Application with Signature
☐ Statement of information you wish to be kept confidential
☒ Material Safety Data Sheets for Hazardous Materials

Aeby- NWHI permit application 2011

Table summarizing samples requested.

Aeby NWHI permit sample collection table

Coral

specie	common name	island	#	size	tot #	study
Acropora cytherea	table coral	FFS	115	1cm	115	genetic and zooxanthellae clade analysis
A. cytherea	table coral	FFS	10	3-5cm	10	histo and EM
A. cytherea	table coral	FFS	tumor removal so # will vary	varied	varied	tumor removal/management tool
Porites	reef coral	all islands(up to 10)	50/island	3-5cm	500	disease survey
Pocillopora	reef coral	all islands(up to 10)	50/island	3-5cm	500	disease survey
Acropora	reef coral	all islands(up to 10)	50/island	3-5cm	500	disease survey
Pavona	reef coral	all islands(up to 10)	50/island	3-5cm	500	disease survey
Montipora	reef coral	all islands(up to 10)	50/island	3-5cm	500	disease survey
total				**2,625 + tumors**		

Fish

specie		island	#	study	tot #
Ctneochaetus strigosus	kole	all islands(up to 10)	20/island	fish disease	200
Acanthurus nigrofuscus	brown surgeonfish	all islands(up to 10)	20/island	fish disease	200
Acanthurus sp.	surgeonfish	all islands(up to 10)	20/island/specie	fish disease	200
Chaetodon sp. x6 species	butterflyfish	all islands(up to 10)	20/island/specie	fish disease	1200
total					**1800**

Zooplankton

specie	common name	island	#	size	tot #	study
various	zooplankton	all islands(up to 10)	100s/tow@ 2 tows/day@30survey days	varies	**1000s**	parasite

Papahānaumokuākea Marine National Monument
Compliance Information Sheet

1. Updated list of personnel to be covered by permit. List all personnel names and their roles here (e.g. John Doe, Diver; Jane Doe, Field Technician, Jerry Doe, Medical Assistant): Dr. Frank Stanton, diver, Leeward Community College; Mareike Sudek, diver, Victoria University at Wellington; Dr. Fenny Cox, diver, UH West Oahu, (alternate)

2. Specific Site Location(s): (Attach copies of specific collection locations): shallow water reefs at Nihoa, Necker, FFS, Gardner, Pearl and Hermes, Maro, Laysan, Lisianski, Midway, Kure depending on cruise schedule.

3. Other permits (list and attach documentation of all other related Federal or State permits): permits were obtained from DAR and FWS for research up in the NWHI in 2002, 2003, and 2004 but they were not always in my name as back then one scientist took charge of all of the permits for the cruise. Permits from the NWHI Reserve in 2005, 2006.

3a. For each of the permits listed, identify any permit violations or any permit that was suspended, amended, modified or revoked for cause. Explain the circumstances surrounding the violation or permit suspension, amendment, modification or revocation. 2006 permit violation. I had an experiment with coral in buckets ongoing on the ship at FFS when the chief scientist made the decision to change the cruise plan, unbeknownst to me, and the ship traveled from FFW to Gardner and back. As such, my corals which were on the ship were also inadvertently transported "out of State waters" as the ship traveled from one island to the next.

4. Funding sources (Attach copies of your budget, specific to proposed activities under this permit and include funding sources. See instructions for more information): PMNM-HIMB MOA

5. Time frame:
Activity start: 6/2011
Activity completion: 12/2012

Dates actively inside the Monument:

F-4b

From: 7/23/11
To: 8/20/11

Describe any limiting factors in declaring specific dates of the proposed activity at the time of application: subject to schedule changes for the NOAA research vessel Hiialakai

Personnel schedule in the Monument: All personnel will be onboard the Hiialakai for the entire trip and will be subject to the cruise schedule which is scheduled for 7/23/11-8/20/11.

6. Indicate (with attached documentation) what insurance policies, bonding coverage, and/or financial resources are in place to pay for or reimburse the Monument trustees for the necessary search and rescue, evacuation, and/or removal of any or all persons covered by the permit from the Monument: The Hiialakai is a self insured federal vessel and all personnel involved with this project are insured by personal health insurance, workman's comp insurance and Diver's Alert Network (DAN).

7. Check the appropriate box to indicate how personnel will enter the Monument:

X☐ Vessel
☐ Aircraft

Provide Vessel and Aircraft information: NOAA ROV Hiialakai

8. The certifications/inspections (below) must be completed prior to departure for vessels (and associated tenders) entering the Monument. Fill in scheduled date (attach documentation):

☐ Rodent free, Date:
☐ Tender vessel, Date:
☐ Ballast water, Date:
☐ Gear/equipment, Date:
☐ Hull inspection, Date:

9. Vessel information (NOTE: if you are traveling aboard a National Oceanic and Atmospheric Administration vessel, skip this question):

Vessel name: Hiialakai
Vessel owner: NOAA
Captain's name:
IMO#:
Vessel ID#:
Flag:
Vessel type:
Call sign:
Embarkation port: Honolulu
Last port vessel will have been at prior to this embarkation:
Length:
Gross tonnage:
Total ballast water capacity volume (m3):
Total number of ballast water tanks on ship:
Total fuel capacity:
Total number of fuel tanks on ship:
Marine Sanitation Device:
Type:

Explain in detail how you will comply with the regulations regarding discharge in the Monument. Describe in detail. If applicable, attach schematics of the vessel's discharge and treatment systems:

Other fuel/hazardous materials to be carried on board and amounts: Z-fix (1 gallon), gluteraldehyde (1 gallon), Clorox (5 gallons), ethanol (1/2 gallon), formalin (1 gallon)

Provide proof of a National Oceanic and Atmospheric Administration (NOAA) Office of Law Enforcement-approved Vessel Monitoring System (VMS). Provide the name and contact information of the contractor responsible for installing the VMS system. Also describe VMS unit name and type:

VMS Email:
Inmarsat ID#:

* Individuals MUST ENSURE that a type-approved VMS unit is installed and that its automatic position reports are being properly received by the NOAA OLE system prior to the issuance of a permit. To make sure your VMS is properly configured for the NOAA OLE system, please contact NOAA OLE at (808) 203-2503 or (808) 203-2500.

* PERMITS WILL NOT BE ISSUED TO INDIVIDUALS ENTERING THE MONUMENT VIA VESSEL UNTIL NOAA OLE HAS CONTACTED THE MONUMENT PERMIT COORDINATOR WITH A 'POSITIVE CHECK' READING.

10. Tender information:

On what workboats (tenders) will personnel, gear and materials be transported within the Monument? List the number of tenders/skiffs aboard and specific types of motors: All research will be conducted from the Hiialakai and will use Hiialakai skiffs.

Additional Information for Land Based Operations

11. Proposed movement of personnel, gear, materials, and, if applicable, samples:
n/a

12. Room and board requirements on island: n/a

13. Work space needs: n/a

DID YOU INCLUDE THESE?
- ☐ Map(s) or GPS point(s) of Project Location(s), if applicable
- ☐ Funding Proposal(s)
- ☐ Funding and Award Documentation, if already received
- ☐ Documentation of Insurance, if already received
- ☐ Documentation of Inspections
- ☐ Documentation of all required Federal and State Permits or applications for permits

LINDA LINGLE
GOVERNOR OF HAWAII

WILLIAM J. AILA, JR.
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

GUY KAULUKUKUI
FIRST DEPUTY

WILLIAM M. TAM
DEPUTY DIRECTOR - WATER

AQUATIC RESOURCES
BOATING AND OCEAN RECREATION
BUREAU OF CONVEYANCES
COMMISSION ON WATER RESOURCE MANAGEMENT
CONSERVATION AND COASTAL LANDS
CONSERVATION AND RESOURCES ENFORCEMENT
ENGINEERING
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION
KAHOOLAWE ISLAND RESERVE COMMISSION
LAND
STATE PARKS

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
DIVISION OF AQUATIC RESOURCES
1151 PUNCHBOWL STREET, ROOM 330
HONOLULU, HAWAII 96813

July 8, 2011

TO: Division of Aquatic Resources File

THROUGH: William J. Aila, Jr., Chairperson

FROM: Francis Oishi
Division of Aquatic Resources

SUBJECT:

DECLARATION OF EXEMPTION FROM THE PREPARATION OF AN ENVIRONMENTAL ASSESSMENT UNDER THE AUTHORITY OF CHAPTER 343, HRS AND CHAPTER 11-200 HAR, FOR PAPAHĀNAUMOKUĀKEA MARINE NATIONAL MONUMENT RESEARCH PERMIT TO DR. GRETA AEBY, UNIVERSITY OF HAWAII, HAWAII INSTITUTE OF MARINE BIOLOGY, FOR ACCESS TO STATE WATERS TO CONDUCT CORAL AND FISH DISEASE RESEARCH ACTIVITIES UNDER PERMIT PMNM-2011-020.

The following permitted activities are found to be exempted from preparation of an environmental assessment under the authority of Chapter 343, HRS and Chapter 11-200, HAR:

Project Title:
Papahānaumokuākea Marine National Monument Research Permit to Dr. Greta Aeby, University of Hawaii, Hawaii Institute of Marine Biology, for Access to State Waters to Conduct Coral and Fish Disease Research Activities.

Permit Number: PMNM-2011-020.

Project Description:
The research permit, as described below, would allow entry and activities to occur in Papahānaumokuākea Marine National Monument (Monument), including state waters, from July 15, 2011 through September 30, 2011.

This permit is intended to cover all activities necessary to examine coral and fish disease occurring within the Monument. The scope of activities in the permit include conducting visual surveys of corals and fish, removing target coral disease growths, and collecting target corals, fish, and zooplankton.

The proposed activities are in direct support of the Monument Management Plan's priority management needs 3.1 – Understanding and Interpreting the NWHI (through action plan 3.1.1 – Marine Conservation Science). This action plan specifies to "monitor shallow-water coral reef

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ecosystems to protect ecological integrity." Activities to support understanding of marine ecosystems, which could include monitoring of diseased coral and fish, are addressed in the EA. This EA summarizes that understanding how populations change could be helpful to forecast, prepare for and mediate potential threats to populations within the Monument (PMNM MMP Vol 2, p.171). Disease monitoring and removal studies, such as those proposed, would enhance this understanding.

Consulted Parties:
The permit application was sent out for review and comment to the following scientific and cultural entities: Hawaii Division of Aquatic Resources, Hawaii Division of Forestry and Wildlife, Papahānaumokuākea Marine National Monument (NOAA/NOS), NOAA Pacific Islands Regional Office (NOAA-PIRO), United States Fish and Wildlife Service Hawaiian and Pacific Islands National Wildlife Refuge Complex Office, and the Office of Hawaiian Affairs (OHA). The Principal Investigator for this project, Greta Aeby, has also been consulted with respect to her experience in successfully conducting studies on coral and fish diseases. In addition, the permit application has been posted on the Monument Web site since March 10th, giving the public an opportunity to comment. The application was posted within 40 days of its receipt, in accordance with the Monument's Public Notification Policy.

Exemption Determination:
After reviewing HAR § 11-200-8, including the criteria used to determine significance under HAR § 11-200-12, DLNR has concluded that the activities under this permit would have minimal or no significant effect on the environment and that issuance of the permit is categorically exempt from the requirement to prepare an environmental assessment based on the following analysis:

1. All activities associated with this permit, including the collection of fish and coral samples have been evaluated as a single action. As a preliminary matter, multiple or phased actions, such as when a group of actions are part of a larger undertaking, or when an individual project is precedent to or represents a commitment to a larger project, must be grouped together and evaluated as a single action. HAR § 11-200-7. Since this permit involves an activity that is precedent to a later planned activity, i.e. the re-survey and sampling of target corals and fish, the categorical exemption determination here will treat all planned activities as a single action.

2. The Exemption Class for Scientific Research with no Serious or Major Environmental Disturbance Appears to Apply. Chapter 343, HRS, and § 11-200-8, HAR, provide for a list of classes of actions exempt from environmental assessment requirements. HAR §11-200-8.A.5. specifically exempts the class of actions which involve "basic data collection, research, experimental management, and resource evaluation activities, which do not result in a serious or major disturbance to an environmental resource." This exemption class has been interpreted to include research related to the development and management of various aquatic organisms such as those being proposed. Accordingly Exemption Class #5, Exempt Items #4 and #5, the former Division of Fish and Game established its own published list of exempted activities types under this exemption class, including "wildlife and game surveys, censuses, inventories, studies . . . collection and captive propagation," as well as the "research activities involving fish transects, [and] occasional fish collection for study and observation." DEPARTMENT OF LAND & NATURAL RESOURCES, EXEMPTION LIST FOR THE DIVISION OF FISH AND GAME 3-4 (January 19, 1976).

The proposed coral and fish health study appears to fall squarely under the exemption class identified under HAR § 11-200-8.A.5., and are succinctly described under the former Fish and Game Division exemption list published in 1976, as involving surveys of aquatic animals and experimental management. As discussed below, no significant disturbance to any environmental resource is anticipated in either the surveys of corals and fish, removing target coral disease growths, or collecting target corals, fish, and zooplankton. Thus, so long as the below considerations are met, an exemption class should include the action now contemplated.

3. Cumulative Impacts of Actions in the Same Place and Impacts with Respect to the Potentially Particularly Sensitive Environment Will Not be Significant. Even where a categorical exemption appears to include a proposed action, the action cannot be declared exempt if "the cumulative impact of planned successive actions in the same place, over time, is significant, or when an action that is normally insignificant in its impact on the environment may be significant in a particularly sensitive environment." HAR § 11-200-8.B. To gauge whether a significant impact or effect is probable, an exempting agency must consider every phase of a proposed action, any expected primary and secondary consequences, the long-term and short-term effects of the action, the overall and cumulative effect of the action, and the sum effects of an action on the quality of the environment. HAR § 11-200-12. Examples of actions which commonly have a significant effect on the environment are listed under HAR § 11-200-12.

A limited number of studies of this type have been undertaken to date and include only an initial survey of coral disease at permanent sites (Aeby 2005) with one follow-up survey which documented the spread and severity of a coral disease outbreak (Aeby 2006). A limited number of fish (taape and goatfish) have been collected for genetic and disease studies and no zooplankton studies have yet been undertaken in the Northwestern Hawaiian Islands. Removal of diseased corals and fishes as well as removal of introduced fishes could be considered a beneficial effect to the environment. With this in mind, significant cumulative impacts are not anticipated as a result of this activity, and numerous safeguards further ensure that the potentially sensitive environment of the project area will not be significantly affected. All activities will be conducted in a manner compatible with the management direction of the Monument Proclamation in that the activities do not diminish monument resources, qualities, and ecological integrity, or have any indirect, secondary, cultural, or cumulative effects. The joint permit review process did not reveal any anticipated indirect or cumulative impacts, nor did it raise any cultural concerns, that would occur as a result of these activities.

The activities would be conducted from the NOAA Ship HI'IALAKAI (PMNM-2011-009) during its July/August cruise. The following table lists additional activities that are anticipated to take place on this cruise pending approval of permit applications.

Table 1. Concurrent Projects Aboard NOAA SHIP HI'IALAKAI

Permit	Purpose and Scope	Location
PMNM-2011-009 NOAA Ship HI'IALAKAI	The permit allows NOAA Ship HI'IALAKAI entry into PMNM. Personnel aboard the vessel will be permitted under separate permits.	All locations

Permit	Purpose and Scope	Location
PMNM-2011-018 Meyer (proposed)	The proposed action is to allow collection of reef fish and tagging of top predators as well as acoustic receiver deployment	All locations
PMNM-2011-027 Thomas (proposed)	The proposed action is to allow collection of algae, bivalves and water samples.	All locations
PMNM-2011-021 Winn (proposed)	The proposed action is to allow water sampling.	All locations
PMNM-2011-023 Au (proposed)	The proposed action is to allow deployment and retrieval of acoustic receivers.	Kure, Lisianski, FFS, Nihoa
PMNM-2011-025 Bowen (proposed)	The proposed action is to allow collection of reef fishes and invertebrates.	All locations
PMNM-2011-022 Godwin (proposed)	The proposed action is to allow quantitative surveys and collections of coral, algae, fish, and non-coral invertebrates.	All locations
PMNM-2011-032 Donahue (proposed)	The proposed action is to allow collection of corals, deploy coral settlement blocks, and measure water chemistry.	All locations

Two proposed activities, Donahue's and Godwin's, include collections of similar coral species. The research and analysis intent of Donahue collections does not overlap with the stated needs for coral collections by the Applicant. Proposed collections by Godwin have the potential to collect similar specimens of diseased corals. While there is potential for duplicative coral sampling, this in essence would be beneficial for Monument management to aid in identification and removal of diseased portions of reef-forming corals. No other activities proposed during this research cruise involve the targeted collection of reef fish or zooplankton. The culmination of these permits, and their disparate activities, occurring throughout the Monument over a 4-week period, is not anticipated to have significant cumulative impacts.

The NOAA Ship OSCAR ELTON SETTE (PMNM-2011-008) may also be in the Monument during this time frame facilitating needs of the monk seal camps under the management permit (PMNM-2011-001).

Since no significant cumulative impacts or significant impacts with respect to any particularly sensitive aspect of the project area are anticipated, the categorical exemptions identified above should remain applicable.

4. Overall Impacts will Probably be Minimal and Insignificant. Any foreseeable impacts from the proposed activity will probably be minimal, and further mitigated by general and specific conditions attached to the permit. Specifically, all research activities covered by this permit will be carried out with strict safeguards for the natural, historic, and cultural resources of the Monument as required by Presidential Proclamation 8031, other applicable law and agency policies and standard operating procedures. This project is an important continuation of prior projects which had been subjected to the public review process. Visual coral and fish surveys are non-invasive by nature and zooplankton are microscopic animals found by the billions in seawater. The small number of fish samples requested would be negligible and include an introduced fish species (taape) which can negatively affect native fish populations.

Conclusion. Upon consideration of the permit to be approved by the Board of Land and Natural Resources, the potential effects of the above listed project as provided by Chapter 343, HRS and Chapter 11-200 HAR, have been determined to be of probable minimal or no significant effect on the environment and exempt from the preparation of an environmental assessment.

_____ _____

William J. Aila, Jr. Date
Chairperson, Board of Land and Natural Resources